

## Revision on *Herimba atkinsoni* Moore, 1879 (Thyrididae : Striglininae) and descriptions of three new subspecies from China and Taiwan

Shen-Horn YEN<sup>1)</sup> and Yasunori KISHIDA<sup>2)</sup>

<sup>1)</sup> Laboratory of Natural Resource Conservation, Department of Biology & Institute of Life Science, National Sun Yat-Sen University, Kaohsiung, Taiwan\*

<sup>2)</sup> Kitazawa 5-20-1-103, Setagaya-ku, Tokyo, 155, Japan

**Abstract** The taxonomy of an exotic thyridid species, *Herimba atkinsoni* Moore is revised. Three new subspecies are described from Taiwan and China (Zhejiang Prov., Tienmushan and Gansu Prov., Xiahe). The biological information of the Taiwanese subspecies is reported for the first time. In addition, based on genitalic features, the genus *Herimba* is confined to the type species, *H. atkinsoni*, by excluding the *Herimba-trachiaria* group from the genus. The genus is here allocated into Striglininae but the phylogenetic relationships with other genera are still uncertain.

**Key words** Day-flying moth, Callidulidae, Thyrididae, moth fauna of Taiwan.

### Introduction

The genus *Herimba* Moore, 1879, with the type species *Herimba atkinsoni* Moore, 1879, were originally described under Callidulidae. Hampson (1896 : 474) was the first reviewer of the genus and transferred it to Thyrididae. Subsequently in 1897, he produced a phylogeny of the family Thyrididae, in which *Herimba* was clustered with *Thyris* Laspeyres. The family placement of *Herimba* by Hampson was adopted and followed by Dalla Torre (1914). The genus was either not included in Callidulidae in Pagenstecher (1902, 1911). However, most subsequent authors (Seitz, 1923 ; Fletcher, 1979 ; Inoue, 1992 ; Haruta, 1993 ; Wang, 1995) still allocated this callidulid-like genus into Callidulidae until Minet (1989) revised the definition of Callidulidae with excluding *Herimba* and placing it back to Thyrididae. In addition, due to its rarity, the genus is still neglected by most taxonomic revisions on Thyrididae (Whalley, 1976) and faunistic studies of the family in China (Chu & Wang, 1996). In the present study, we will describe three new subspecies of *Herimba atkinsoni* from Taiwan and China. The subfamily placement, generic definition and phylogenetic relationships of *Herimba* are also discussed.

### Depositories of materials examined

BMNH : British Museum (Natural History), London, England.

DEIC : Deutsches Entomologisches Institut, Eberswalde, Germany.

SHYC : S. H. Yen Collection, Taiwan.

TPMT : Taiwan Provincial Museum, Taipei, Taiwan.

YKCT : Y. Kishida Collection, Tokyo, Japan.

WMM : Witt Museum, München, Germany.

ZFMK : Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, Germany.

ZSM : Zoologische Staatssammlung in München, Germany.

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\* Present address : 11, Alley 10, Lane 93, Shin-Nan Rd., Sect. 1, Chung-Ho City, Taipei Hsien, Taiwan.

## Taxonomic account

### *Herimba atkinsoni atkinsoni* Moore (Figs 1 : I, 3 : A-D)

*Herimba atkinsoni* Moore, 1879, in Hewitson & Moore, *Descr. new Indian lepid. Insects Colln late Mr Atkinson* : 21, pl. 2, fig. 3 ; Hampson, 1896 : 474 ; Hampson, 1897, *Proc. zool. Soc. Lond.* **1897** : 607, fig. 2 ; Dalla Toore, 1914, in Wagner, *Lepid. Cat.* **20** : 4 ; Fletcher, 1979, in Nye, *Generic Names Moths World* **5** : 98 ; Haruta, 1993, *Tinea* **13** (Suppl. 3) : 41, pl. 53, fig. 36 ; Wang, 1995, *Guide Book Insects Taiwan* **12** : 91, figs.

Length of forewing : ♂, 13.1–13.2 mm, ♀, 13.5 mm. Antennal length 5.1–5.2 mm in male. A medium-sized, callidulid-like thyridid moth with ground colour cuprous-brown, a continuous white transverse medial band on forewing and many yellowish brown dots. Distinguishable from other subspecies described below by having white bands on forewing narrower, light brown dots darker and fewer, CuA<sub>2</sub> spot absent, only one white dot on hindwing of male, uncus with more deeply forked, juxta with shorter arms and less developed median plate, valva with small process near succulus and more rounded apex.

Male. Head : Vertex and frons smooth-scaled, dark brown, covered by filiform scales. Labial palpus curved upwards, apical segment porrect, much shorter than the second. Antenna filiform. Proboscis developed, unscaled. Chaetosemata absent. Ocelli absent. Thorax : Fore tibia with epiphysis, hind tibial spurs 2-paired ; tegula extending to hind margin of mesothorax with yellowish black scales ; thorax blackish brown. Forewing broad and triangular, upperside colouration blackish brown with fine brown dots ranged on subcostal and subbasal area, medial band around 1/9 as wide as forewing length, pearly-white, continuous, margin undulate and emarginate centrally, two minute pearly-white spots within the cell, a lightly larger spot near the apex ; underside similar to upperside but all the yellowish-brown spots slightly larger ; venation with discoidal cell less than 1/2 as long as wing length, Sc ending at proximal 1/2 of costa, R<sub>1</sub> emitting from discoidal cell at proximal 1/3, R<sub>2</sub> running almost parallel to R<sub>1</sub>, R<sub>3</sub> to R<sub>5</sub> arising separately, CuA<sub>2</sub> emitting from discoidal cell at distal 1/4, 1A+2A with a basal fork. Hindwing broad and rounded, outer margin slight produced, frenulum single, upperside colouration similar to that of forewing but without white medial band, 6–7 transverse brownish-yellow spot series ranging from submarginal to basal part, only one white spot within the discoidal cell ; underside similar to that of upperside but with larger spots ; discoidal cell about 3/5 as long as wing length ; Sc and R separate near base, with R<sub>1</sub> joining Sc about the middle of discal cell, Sc+R<sub>1</sub> running parallel to Rs to the end of cell, CuP rudimentary, not tubular. Abdomen : Blackish-brown with fine yellow semi-annular bands dorsally and creamy white ventrally.

Female. Slightly larger than male in size. Head with much longer labial palpus than that of male. Wing shape broader and more rounded, colouration with more prominent and larger yellow spots ; hindwing with two white spots within discoidal cell, the proximal one larger than the distal.

Male genitalia. Uncus somewhat rectangular, bifurcate, apex of each fork slightly emarginate, setose laterally ; gnathos simple with very slender arms fusing medially ; subscaphium developed with numerous hairs ; tegumen broad, a pair of arms extending downwards from lateral-middle of tegumen, coremata arising from a pocket-like structure on apical part of each arm ; vinculum short, slender with a small saccus extending posteriorly ; transtilla simple ; valva simple, elongated with curved hairs, median process obtuse, slightly curved interiorly ; juxta with two arms elongated and setose, median plate less developed than in other

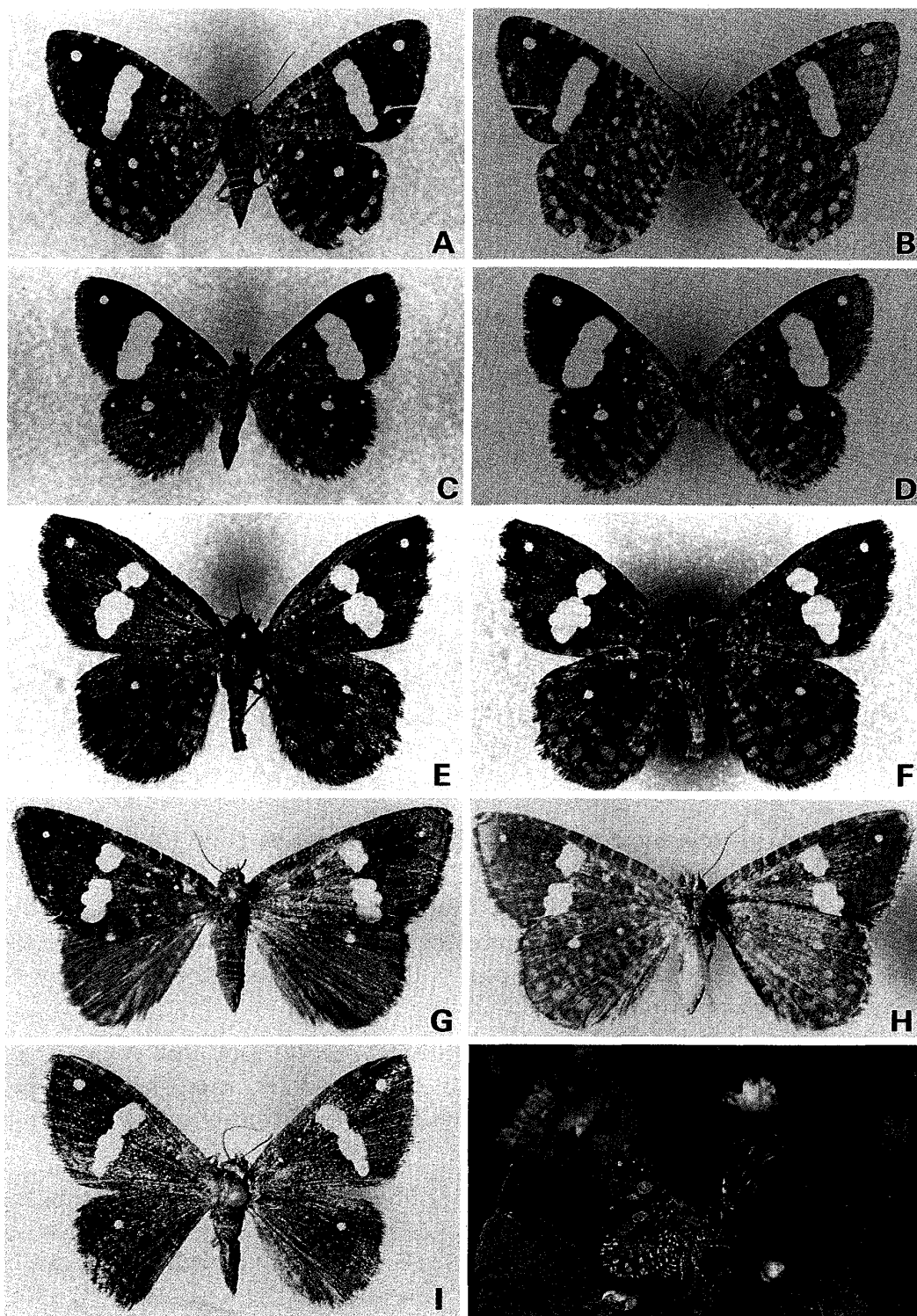


Fig. 1. *Herimba atkinsoni* subspecies. A. *H. a. tienmushanensis* subsp. n., holotype, male. B. *Ditto*, underside. C. *H. a. gansuensis* subsp. n., holotype, male. D. *Ditto*, underside. E. *H. a. disjuncta* subsp. n., holotype, female. F. *Ditto*, underside. G. *H. atkinsoni* from "Japan". H. *Ditto*, underside. I. *H. a. atkinsoni*. J. A male *H. a. disjuncta* subsp. n. resting on fallen leaves at Fushan Botanical Garden (Photo J. L. Jean).

subspecies; aedeagus stout with a small apical process curved downwards, coecum penis developed; vesica with two groups of cornuti, one consisting of 3 stronger spines and the other of 5-6 smaller ones.

Female genitalia. Not yet examined. Refer to description of *H. a. disconjuncta* subsp. n. for the species.

Specimens examined. *Herimba atkinsoni atkinsoni*: 1 ♂, SIKKIM: Phesima, Naga Hills, Assam, 24. VII. 1913 (O. Molla leg.) (BMNH); 1 ♂, NEPAL: Godavari, 1,500 m, 2-6. VI. 1987 (T. Miyashita leg.) (YKCT); 1 ♂, Kathmandu, Mt Phulchouki, 2,075 m, 30. IV-5. V. 1996 (T. Haruta leg.) (YKCT); 1 ♀, INDIA, Khasia Hills, collecting data unlabeled (BMNH); 1 ♀, BHUTAN: Pankasari Hill, collecting data unlabeled, ex R. Oberthür Coll. (ZFMK); 1 ♂, CHINA: Tibet, collecting data unlabeled (BMNH).

Geographical distribution. The subspecies is known from India, Tibet, Bhutan, Nepal and probably also present in Bangladesh (Fig. 5).

Remarks. The male genitalic figure of *Herimba atkinsoni* given by Minet (1989) is originated from S. W. China (Yunnan, Tali) (prep. J. Minet 944, MNHN) (Minet, *pers. comm.*). The apex of the bifid uncus, however, is not truncate but acute as described above. We suspected that such contrary was possibly caused by slight difference as mounting genitalia on the slide.

Habitat. According to Haruta's (1992) description, the collecting site at Godavari (Nepal) is with abundant Fagaceae, Lauraceae and Theaceae trees.

Biology. Unknown.

***Herimba atkinsoni tienmushanensis* Yen & Kishida, subsp. n. (Figs 1: A-B, 4: E)**

Length of forewing: ♂, 13.2 mm, ♀, 14.3 mm. Antennal length 5.2-5.3 mm in male. Different from *H. a. atkinsoni* in more prominent yellowish brown dots, larger size, two white dots on hindwings of both sexes, uncus with more emarginate apex, juxta with more slender arms and developed median plate.

Male genitalia. Uncus curved downwards, bifurcate, apex of each fork emarginate; valva with a median process stout; juxta with two arms slenderer, a median plate produced posteriorly; aedeagus with two groups of cornuti, one of 4-5 thicker spines and the other of more number of longer ones.

Type material. Holotype. ♂, CHINA: Chekiang Prov. (present name=Zhejiang), Ost Tien-mu-shan, 31. V. 1931 (H. Höne leg.) (ZFMK). Paratypes. 1 ♂, same data as holotype (ZSM), 5 ♀, same locality, 2. VI. 1931 (H. Höne leg.) (ZSM), 1 ♀, same locality, 20. VI. 1931 (H. Höne leg.) (ZFMK), 1 ♂, same locality, 4. VIII. 1931 (H. Höne leg.) (NMNS), 1 ♀, same locality, 7. VIII. 1931 (H. Höne leg.) (ZFMK); 1 ♀, Mokanshan, 28. VII. 1930 (H. Höne leg.) (ZFMK).

Geographical distribution. The subspecies is known from E. China (Fig. 5), where this species is recorded for the first time.

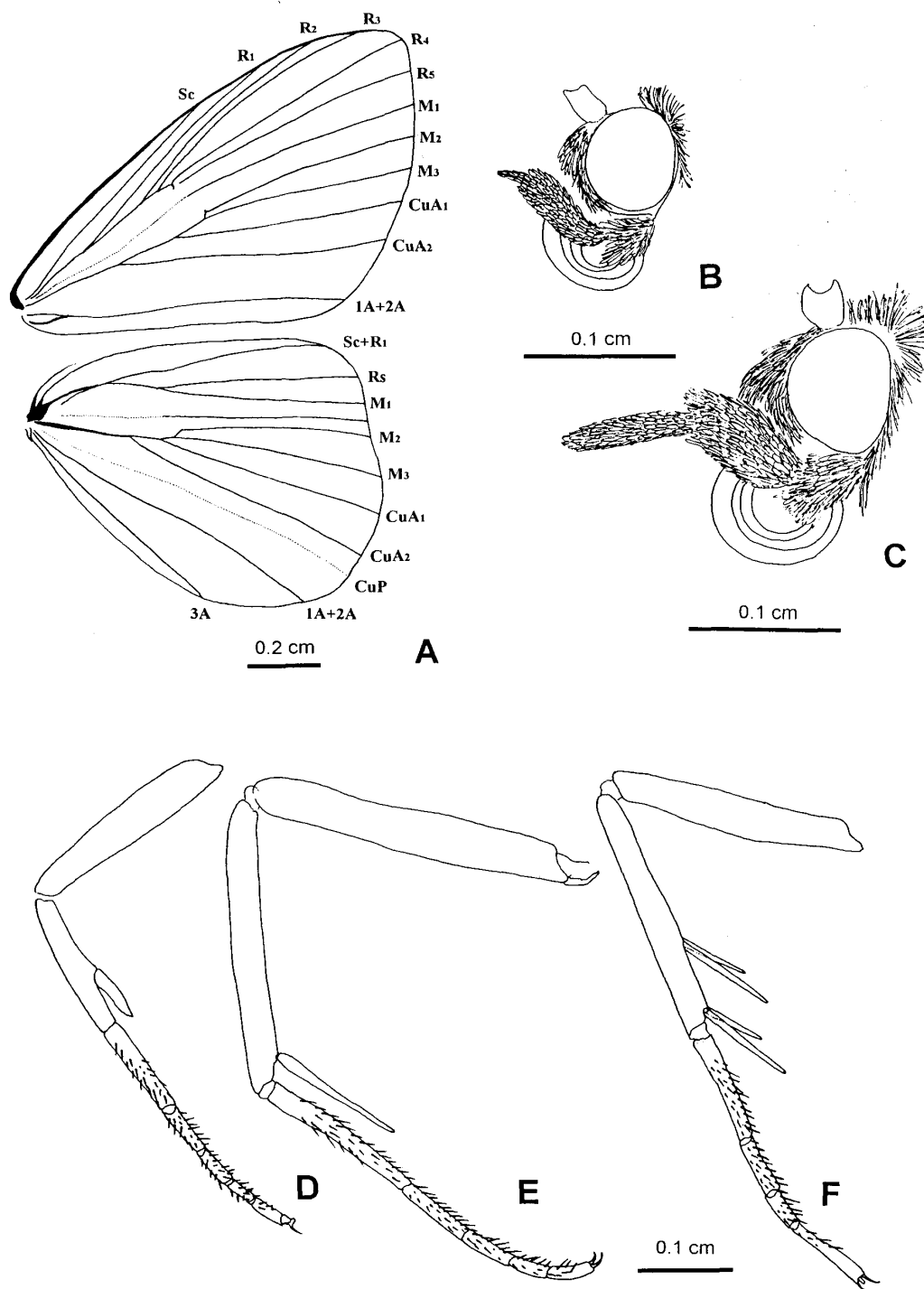


Fig. 2. External morphology of *Herimba atkinsoni disconjuncta* subsp. n. A. Venation. B. Male head, lateral view. C. Female head, lateral view. D-F. Foreleg (D), midleg (E) and hindleg (F).

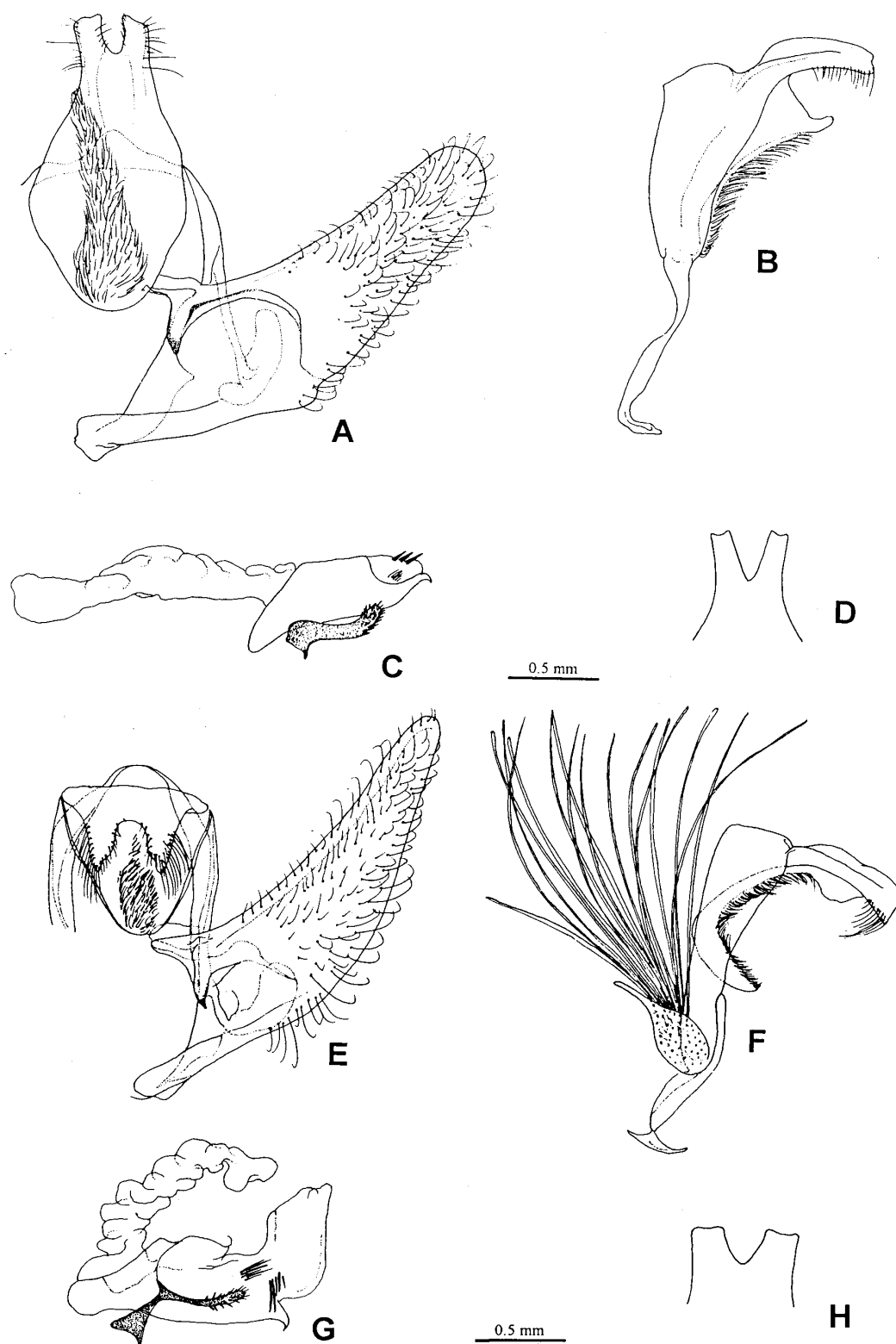


Fig. 3. Male genitalia of *Herimba atkinsoni* subspecies. A-D. *H. a. atkinsoni*, Nepal (A: ventral view, with aedeagus and left valva omitted. B: lateral view, with valva, coremata and tegumen arm omitted. C: aedeagus with juxta, lateral view. D: uncus, ventral view). E-H. *H. a. disconjuncta* subsp. n., Taiwan (E: ventral view, with aedeagus and left valva omitted. F: lateral view. G: aedeagus with juxta, lateral view. H: uncus, ventral view).

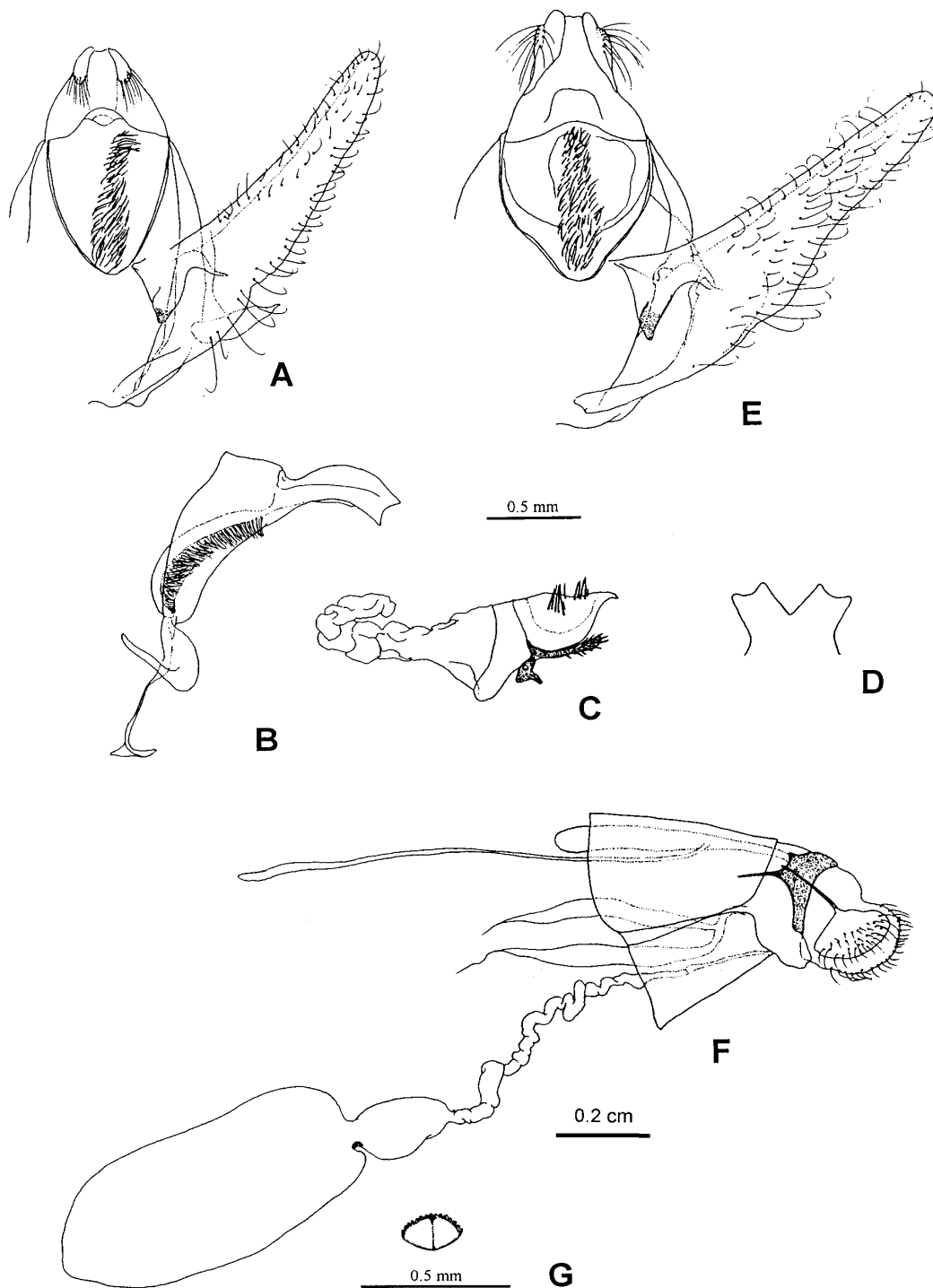


Fig. 4. Genitalia of *Herimba atkinsoni* subspecies. A-D. Male genitalia of *H. a. gansuensis* subsp. n., China, Gansu Prov. (A: ventral view, with aedeagus and left valva omitted. B: lateral view with valva, coremata and tegumen arm omitted. C: aedeagus with juxta, lateral view. D: uncus, ventral view). E. Male genitalia of *H. a. tienmushanensis* subsp. n., China, Zhejiang Prov. (ventral view, with aedeagus and left valva omitted). F-G. Female genitalia of *H. a. disconjuncta* subsp. n., Taiwan (F: lateral view. G: signum).

Habitat. Unknown.

Biology. Unknown.

***Herimba atkinsoni gansuensis* Yen & Kishida, subsp. n.** (Figs 1 : C-D, 4 : A-D)

Length of forewing : ♂, 12.7 mm. Antennal length 5.1 mm in male. Different from *H. a. tienmushanensis* subsp. n. in having smaller size, fewer dots on wings, broader forewing white band and slenderer valva.

Male genitalia. Valva simple, slenderer than in the preceding subspecies, with a median process stout ; juxta with two arms slender and a median plate smaller than in the following subspecies. Aedeagus vesica with two groups of cornuti, one of 4-5 thicker spines and the other of more number of smaller ones.

Type material. Holotype. ♂, CHINA : Gansu Prov., Xiahe (=Xia-her, Southwest of Xi-Ning City), 3,000-3,500 m, 2. V-22. VI. 1992 (Westahat leg.) (WMM)

Geographical distribution. The subspecies is known from C. China (Fig. 5), where this species is recorded for the first time.

Habitat. No recent collection of this subspecies from China is available, but the habitat of Tien-Mu-Shan area should belong to the temperate evergreen oak forests.

Biology. Unknown.

***Herimba atkinsoni disconjuncta* Yen & Kishida, subsp. n.** (Figs 1 : E-F, J, 2, 3 : E-H, 4 : F-G)

*Herimba atkinsoni* : Matsumura, 1931, 6000 *illust. Insects Japan-Empire* : 749, no. 613 (fig.) ; Wang, 1995, *Guide Book Insects Taiwan* 12 : 84 (figure), 90 (figures) ; Inoue, 1992, in Heppner & Inoue, *Lepid. Taiwan* 1 (2) : 110.

Length of forewing : ♂, 12.7-13.1 mm, ♀, 14.7-14.8 mm. Antennal length 5.2-5.3 mm in male. Readily distinguishable from all the other subspecies by the discontinuous white transverse medial band on forewing, uncus with more stout apex, juxta with more elongated median plate and pointed median basal process on valva.

Male genitalia. Uncus extending slightly downwards, bifurcate, apex of each fork nearly truncate, setose laterally ; valva simple, elongated with a median process pointed ; juxta with two arms slender and setose, a median plate triangular laterally ; aedeagus vesica with two groups of cornuti, one of 4-5 thicker spines and the other of more number of smaller spines.

Female genitalia. Lobes of papillae anales somewhat triangular laterally ; apophyses posteriores short, extending to anterior margin of 8th abdominal segment ; apophyses anteriores short, extending to around post margin of 7th abdominal segment ; bursa copulatrix with corpus bursae globular, reaching beginning of 5th segment ; ductus bursae long, spiral ; signum single on ventrad of conjunction between cervix bursae and corpus bursae, somewhat oval with posterior margin dentate and more sclerotized.

Type material. Holotype. ♀, TAIWAN : Nantou Hsien, Ren-ai, Songgang, 23. IV. 1995 (S. H. Yen leg.)(NMNS). Paratypes. 1 ♂, same locality as holotype, 14. IV. 1994 (S. H. Yen leg.) (abdomen and right wings dissected, NMNS) ; 1 ♀, Taipei Hsien, San-Hsia, Pei-Cha-Ti'en-Shan, 14. V. 1995 (S. H. Yen leg.) (dissected, NMNS) ; 1 ♂, Taichung Hsien, Kukuan,



9. V. 19?? (H. Y. Wang) (TPMT); 2 ♂ 2 ♀, Nantou Hsien, Polisha (present name=Puli),  
 10. IV. 1910 (H. Sauter leg.) (DEI); 1 ♀, Nantou Hsien, Nanshanchi, 20. V. 1987 (C. C. Luo  
 leg.) (YKCT); 1 ♀, Kaohsiung Hsien, Kosempo (present name=Ji'a-shi'en), IV. 1912 (H.  
 Sauter leg.) (DEI); 1 ♀, Taichung Hsien, Herping, Lishan, 21. VII. 1968 (H. Fukuda leg.)  
 (BMNH); 1 ♀, exact locality unknown, VII. 1976 (K. Sasaki leg.) (YKCT).

Geographical distribution. The subspecies is known from Taiwan (Fig. 5).

Remarks. A male specimen from "Japan" which is quite similar to the Taiwanese sub-  
 species, was discovered in WMM [collecting data: 1 ♂, JAPAN: Shiga Pref., Mt Hi-ei,  
 800–900 m, 22. VII. 1955 (Murayama leg.) (WMM, ex F. Daniel Coll.)] (Figs. 1: G–H).  
 Compared with Taiwanese material, the individual is slightly larger, having fewer spots on  
 the hindwings and with identical genitalia. The locality name on the label, however, seems  
 incorrect and not recognized in Japan, and neither record nor specimen of this species has ever  
 been discovered or reported from Japan, where the moth fauna has been studied in detail. It  
 is suspected that the specimen from Murayama, a famous collector of Taiwan butterflies, was  
 actually received from Taiwan, but was unfortunately misfiled together with some Japanese  
 butterflies (or labels) for exchange with F. Daniel. Therefore, the specimen is excluded from  
 the type materials of the new subspecies, and the identity of it is tentatively retained and has  
 not been justified.

Habitat. The habit preference of this subspecies is mainly temperate to subtropical  
*Machilus-Quercus* forests. The vegetation of the type locality at Fushan Botanical Garden,  
 I-Lan Hsien, is dominant with the following species: tree-layer—*Machilus kusanoi*, *M.*  
*thunbergii*, *Cinnamomum kanehirae*, *C. micranthum*, *Neolitsea acuminatissima*, *Phoebe*  
*formosana*, *Castanopsis longicaudata*, *C. longinux*, *Schefflera octophylla*, *Daphniphyllum*  
*glaucescens* ssp. *oldhamii*, *Engelhardia roxburghiana*, *Myrica rubra* var. *acuminata*, *Prunus*  
*phaeosticta*, *Cleyera japonica*, *Pyrenaria shinkoensis*; shrub layer—*Blastus cochinchinensis*,  
*Bredia oldhamii* and *Hydrangea chinensis*; herb layer—*Elatostema edule*, *Pilea distachys*  
 and *Dryopteris formosana*. The forests are also rich in climbers and lianas such as *Actinidia*  
*callosa* var. *formosana*, *Ficus pumila* var. *awkeotsang*, *Piper kadsura*, *Pileostegia vibrunoides*  
 and *Heterosmilax indica*.

Biological notes. According to the first author's observation at Songgang in 1994 and at  
 Fushan Botanical Garden from 1995 to 1997, the adult occurrence is probably bivoltine in  
 middle spring and late summer. The subspecies is an active day-flier with similar behaviours  
 of *Lycaenidae* or *Callidulidae*. Adults usually fly fast about 1–5 m above the ground and  
 along the margin of primary forests. They sometimes rest or absorb water on shrubs or herbal  
 layers. In 1996, one larva was collected from *Cinnamomum kanehirae* Hayata (Lauraceae)  
 by Mr. Y. B. Fan, Taiwan Forest Research Institute (TFRI), but the chaetotaxy of the larva  
 and pupal case were not examined.

### Comments on the genus *Herimba*

In Hampson's (1897) phylogeny of Thyrididae, the genus *Herimba* was grouped together with  
*Thyris* by giving no reason, but in his key to the thyridid genera, *Herimba* was regarded closer  
 to a wasp-like genus *Hyperthyris* Leech in having  $R_4$  and  $R_5$  stalked in forewing. The  
 characters of forewing venation and labial palpus were emphasized by Hampson, however,  
 those characters were not considered as syapomorphies or diagnosed characters in Whalley's  
 (1971, 1976) denifition of thyridid subfamilies. The genus *Herimba* could be distinguished  
 from those pachythyridine genera (*Thyris*, *Glanycus* Walker and *Hyperthyris*) by having

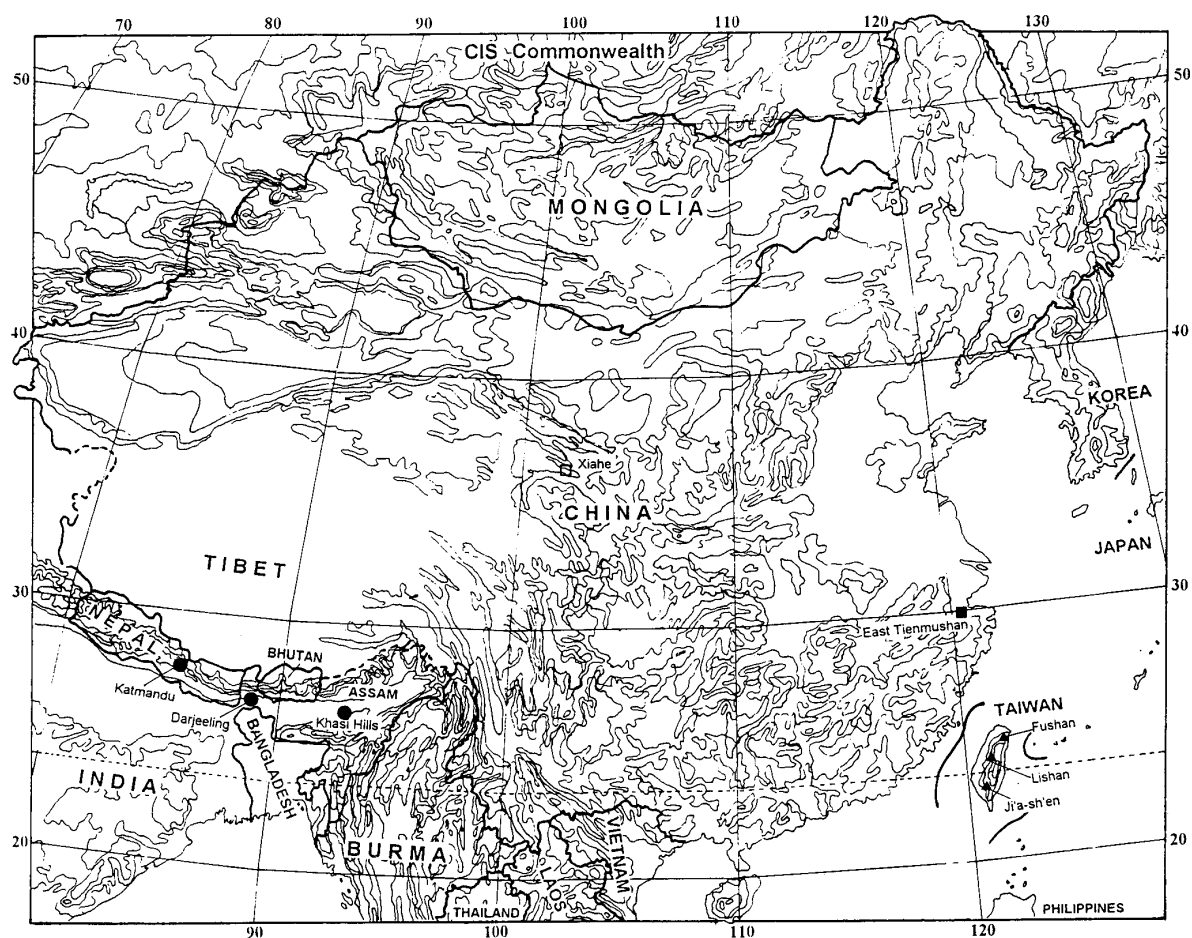


Fig. 5. Distribution map of *Herimba atkinsoni* subspecies. ●: *H. a. atkinsoni*, ■: *H. a. tienmushanensis* subsp. n., □: *H. a. gansuensis* subsp. n., ▲: *H. a. disconjuncta* subsp. n.

slender body, bifid uncus and female genitalia without secondary sac. The day-flying behaviour shared by *Herimba* and pachythyrid genera may be convergent. At present, the phylogenetic relationships between *Herimba atkinsoni* and the other thyridid genera are uncertain because no phylogenetic analysis of this family is available. Therefore, we attempted to search for characters of *Herimba* which are shared by and agreeable to one of the thyridid subfamilies recognized by Whalley (1971, 1976). Eventually, four major characters as follows support that *Herimba* could be placed in Striglininae.

1. Tarsal segments with rows of spines.
2. Hindwing with  $Sc+R_1$  and  $R_s$  stalked.
3. Male genitalia complicated, with bifid modified uncus.
4. Females without secondary sac.

In terms of the most allied genera in Striglininae, we suspected that *Striglina* Guenée and *Banisia* Walker may be closer to *Herimba* than to other genera in having coremata arising from pocket-like structure on apex of tegumenal arms, bifurcate uncus, modified subscaphium and strongly sclerotized arms of juxta.

Additionally, in his study of NE. Asian Lepidoptera, Leech (1898) described two additional new *Herimba* species (under Callidulidae), *H. nigropuncta* and *H. flavilinea* from C. and W.

China, and transferred *Abraxas trachiararia* Oberthür, 1893 from the geometrid genus to *Herimba*. These “*Herimba*” species with similar wing marking and shape to the geometrid genus *Euryobeidia* Fletcher, 1979 have not yet been discussed and revised so far. On the basis of the first author’s preliminary observation and dissecting result, these species are also suggested to be allocated in Thyrididae, but in fact are unlikely to be congeneric with *Herimba atkinsoni*. The “*Herimba*”-*trachiararia* species group will be revised in a separate paper in the near future.

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## 摘 要

コモンマドガの再検討と 3 新亜種の記載 (顔 聖紘・岸田泰則)

*Herimba atkinsoni* Moore, コモンマドガという蛾は、セセリチョウ科のキコモンセセリに斑紋が酷似しているだけでなく、昼行性で、蛾とは思えない変わった種である。この蛾は当初イカリモンガ科の下に記載されたが、科の所属については Minet (1989) がマドガ科に所属するものとの論文を発表するまで学者により見解が異なり、イカリモンガ科またはマドガ科として扱われ、一定していなかった。筆者らはこの興味深い蛾の各地の標本を検討した結果、地理的変異を認めたのでここに原名亜種の他に 3 新亜種を記載した。

*Herimba atkinsoni atkinsoni* Moore インド, ネパール, ブータン, 中国 (チベット)

*Herimba atkinsoni tienmushanensis* subsp. n. 中国 (浙江省天目山)

*Herimba atkinsoni gansuensis* subsp. n. 中国 (甘肅省夏河)

*Herimba atkinsoni disconjuncta* subsp. n. 台湾

また、記載以外に台湾亜種の生態を記述したが、本種の生態についての知見は初めてであった。なお、属 *Herimba* の構成は属の模式種である本種のみに限定し、従来 *Herimba* 属に含まれていた *trachiaria* 種群はこの属から排除した。この問題については近い将来に検討を行う予定である。

白斑線網蛾之分類検討以及中國與臺灣產三個新亞種之描述 (網蛾科: 線網蛾亞科) (顔 聖紘・岸田泰則)

本文検討一種珍奇的網蛾—白斑線網蛾之分類學, 並描述產自臺灣, 中國浙江省天目山及甘肅省夏河の三個新亞種。其中臺灣產亞種之生物學資訊爲首次報導。此外, 根據生殖器形態的差異, 我們建議將 *Herimba* 屬限定於其模式種—白斑線網蛾, 並排除 *Herimba trachiaria* 種群。作者於本文中將此屬置於線網蛾亞科, 但其與其它屬之系統發生關係仍未確定。

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